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**TECHNICAL REPORTS, SPECIAL REPORTS, AND TECHNICAL NOTES:
FY 1981**

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FOREWORD

This report lists all technical reports, special reports, and technical notes that were published by this Center in FY 1981. Publications in each category are listed in chronological order under seven areas: Education and training, organization management, personnel administration, human performance, manpower management, R&D methods and techniques, and bibliographies, reviews, and summaries.

Qualified users may request copies of technical reports from the Defense Technical Information Center, Cameron Station, Alexandria, VA 22314 (Telephone: Commercial (202) 274-7633 or Autovon 284-7633). Technical reports listed that have unlimited distribution can also be obtained from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161 (Telephone: Commercial (703) 487-4650 (no autovon)).

Special reports may have limited distribution and are not generally available from DTIC, either because they are of very limited interest, or the sponsor desires to control their availability. Some technical notes are working papers that serve as a relatively informal vehicle for project documentation and for information exchange with project sponsors, scientific peers, and Center personnel.

JAMES F. KELLY, JR.
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EDUCATION AND TRAINING

TECHNICAL REPORTS

Mathematical Requirements in Navy Class "A" Electronics Schools. TR 81-4. January 1981. J. Sachar and M. S. Baker. (AD-A093 946)

Instructors in 14 Navy electronics "A" schools (12 basic core and 2 advanced) were presented with a list of 70 mathematical skills and asked to indicate (1) how important they were to successful school performance and (2) whether they were prerequisite, reviewed, or taught in the "A" schools. Also, they were asked to state the number and type of performance aids used in the course and during the exam. Responses showed that, of the 70 skills surveyed, 19 do not appear in any basic core course and 2 more do not affect performance. Although the skills rated as affecting performance are generally considered as prerequisite in all schools, many students require review in these skills for successful performance. Across all schools, the most important skills are (1) addition, subtraction, multiplication, and division of numbers, (2) squares and square roots of positive numbers, (3) addition and subtraction of like units, (4) multiplication and division of like and/or unlike units, (5) substitution of known values into a given formula, and (6) transpositions of algebraic expressions. Performance aids are permitted in all courses but one, both during the course and during exams.

Conference Proceedings: Aptitude, Learning, and Instruction: Volume I. Cognitive Process Analyses of Aptitude; Volume II. Cognitive Process Analyses of Learning and Problem Solving. TR 81-5. January 1981. R. E. Snow, P-A. Federico, and W. E. Montague (Eds.). (AD-A099 209, AD-A099 208)

This report provides a summary of activities at a conference on Aptitude, Learning, and Instruction held March 1978 in San Diego, California.

Computer-managed Instruction in the Navy: II. A Comparison of Two Student/Instructor Ratios in CMI Learning Centers. TR 81-6. February 1981. N. Van Matre, M. Hamovitch, K. A. Lockhart, and L. Squire. (AD-A096 063)

Students at the Basic Electricity and Electronics School, San Diego were assigned to learning centers (LCs) with either an 18:1 or 30:1 student/instructor (S/I) ratio to determine the effects on student and instructor behavior in an individualized computer-managed instruction (CMI) course. Results of data analyses revealed that the 30:1 S/I ratio resulted in longer training time for students in certain career patterns than did the 18:1 S/I ratio. The S/I ratio had no consistent differential effect on first-try scores on module or phase tests, number of remediations per module, number of unsatisfactory performance tests, or student attrition from the course. Instructors in the 30:1 S/I ratio spent less time per question answering student technical questions and more time on administrative duties than did instructors in the 18:1 condition. It was recommended that CMI courses should be developed or revised to allow the computer to perform the maximum amount of administrative functions to reduce the CMI instructor workload. In any future efforts to assess the effects of S/I ratio changes, technical schools should consider performance data for students and instructors, and relate it to variables such as course content, testing strategies, and LC operating procedures.

EDUCATION AND TRAINING (Continued)

Computer-managed Instruction in the Navy: III. Automated Performance Testing in the Radioman "A" School. TR 81-7. March 1981. M. Hamovitch and N. H. Van Matre. (AD-A096 721)

Automated performance testing (APT) procedures were compared with manual testing procedures during computer-managed instruction (CMI) at the Radioman "A" school to determine if APT shortened teletyping training time. The effects of computer-generated error distribution reports (EDRs) on performance progress were also studied. Results showed that APT speeded testing and scoring and shortened training time. Daily receipt of EDRs shortened the typing portion of the course by 3 days.

Computer-managed Instruction in the Navy: IV: The Effects of Test Item Format on Learning and Knowledge Retention. TR 81-8. March 1981. K. A. Lockhart, P. T. Sturges, N. H. Van Matre, and J. A. Zachai. (AD-A097 031)

The relative effectiveness of multiple-choice (MC) and constructed-response (CR) test formats in computer-managed instruction (CMI) was compared. Most CMI tests use the familiar MC format with standard answer forms because they can be machine-scored and sent directly into the computer. CR formats, which require students to generate their own written answers to each item, cannot be directly input to the computer, but they permit a more varied range of student responses. The MC format was compared with three variations of the CR format using four test groups, each consisting of 30 trainees assigned nonsystematically from the basics course at the Propulsion Engineering School, Great Lakes Naval Training Center. No measurable differences were found among the groups in amount of learning. This result implies that the MC format is preferable since it is less costly and is compatible with the current CMI system. The CR group that was given no prompts or cues as to the possible answers showed better retention of what they had learned. However, this format is least compatible with the CMI system and was more time consuming for students and staff. Before this CR format could be operationally feasible, costs would have to be controlled significantly--possibly, in part, by developing a CMI capability for automatic processing of CRs.

Generalized Maintenance Trainer Simulator (GMTS): Development of Hardware and Software. TR 81-9. April 1981. D. M. Towne and A. Munro. (AD-A098 384)

This report describes the development of the generalized maintenance trainer simulator (GMTS) and provides a preliminary analysis of its suitability for use in the school environment. The GMTS is an advanced two-dimensional trainer, developed on the basis of information gathered from field testing of a previous laboratory model. The trainer is a relatively low-cost, generalizable device capable of providing maintenance training for a wide variety of electronics equipments. Test and evaluation in the school environment are scheduled.

Electronic Equipment Maintenance Training (EEMT) System: System Definition Phase. TR 81-11. May 1981. S. M. Pine, C. G. Koch, and V. M. Malec. (AD-A102 200)

The electronic equipment maintenance training (EEMT) system is being developed to augment "A" school level training. The system should provide electronics trainees with hands-on practice of generic preventive and corrective

EDUCATION AND TRAINING (Continued)

maintenance procedures by means of self-paced computer-assisted and computer-managed instruction. This report summarizes the system definition phase of the EEMT program.

Effects of Performance-oriented Text Upon Long-term Retention of Factual Material. TR 81-22. September 1981. P. T. Sturges, J. A. Ellis, and W. H. Wulfeck, II. (AD-A106 096)

Little information exists on variables affecting long-term retention of factual material in technical training. Two experiments compared a job-oriented text with a topic-oriented text. Twenty-four junior college students studied individualized booklets to learn factual material, on either metal fasteners or micrometers, to criterion. Six months later, an unanticipated retention test was given. On the test on metal fasteners, students who had received job-oriented text had significantly better retention on recall, but there were no differences on a recognition test. There were no differences for the text on micrometers. The results are discussed in terms of the role of supplementary related material on retention of factual material.

Tailoring Shipboard Training to Fleet Performance Needs: II. Propulsion Engineering Problem Analysis. TR 81-23. September 1981. C. R. Chiles, M. L. Abrams, M. R. Flaningam, and R. V. Vorce. (AD-A105 677)

A needs assessment strategy was designed to identify and assess differences between actual and desired performance of main propulsion personnel and deficiencies in the various support and administrative systems. Shipboard managers and operator personnel were interviewed aboard the "pilot" ship during a 14-day transit from Japan to the United States during November 1977. Both managers and operators reported the primary performance problem to be watchstanding; specifically, the difficulty of attaining and maintaining three fully qualified propulsion watch sections at all watch stations. Substantial deficiencies were also reported in the support and administration systems. The needs assessment strategy provided sufficient information about main propulsion performance deficiencies to initiate development of training solutions.

The Development of Four Job-oriented Basic Skills (JOBS) Programs. TR 81-24. September 1981. S. R. Harding, B. Mogford, W. H. Melching, and M. Showel. (AD-A106 370)

This report describes the development of four training courses for Navy personnel whose ASVAB scores were below the minimum required for entry into Navy Class "A" technical schools. The training courses were designed to increase their mastery of the skills and knowledge deemed to be prerequisites for success in selected Class "A" schools. This effort was directed towards preparing these low-scoring personnel to enter Class "A" schools in the following areas: propulsion engineering, operations, administrative/clerical, and electricity/electronics.

EDUCATION AND TRAINING (Continued)

SPECIAL REPORTS

Deployable Acoustic Analysis Training Using the Digital Acoustic Sensor Simulator (DASS): IV. Ordinal Syllabus. SR 81-5. December 1980. S. I. Windle, H. D. Kribs, and J. N. Ladd. This publication is required for official use or for administrative or operational purposes only. Distribution is limited to U.S. government agencies.

The overall objective of the project was to develop a generic training system that can be delivered to all relevant air ASW platforms in deployed settings. This system should have, as its delivery vehicle, a digital acoustic sensor simulator (DASS) that can stimulate any pertinent on-board acoustic processor. This report provides the ordinal syllabus for this training system.

Deployable Acoustic Analysis Training Using the Digital Acoustic Sensor Simulator (DASS): V. Training Support Requirements Analysis. SR 81-6. December 1980. J. N. Ladd, H. D. Kribs, and S. I. Windle. This publication is required for official use or for administrative or operational purposes only. Distribution is limited to U.S. government agencies.

The overall objective of the project was to develop a generic training system that can be delivered to all relevant air ASW platforms in a deployed setting. This system should have, as its delivery vehicle, a digital acoustic sensor simulator (DASS) that can stimulate any on-board acoustic processor. This report describes the training support requirements for this training system.

Deployable Acoustic Analysis Training Using the Digital Acoustic Sensor Simulator (DASS): VI. Deployable Training System Requirements. SR 81-7. January 1981. S. I. Windle, J. N. Ladd, and H. D. Kribs. This publication is required for official use or for administrative or operational purposes only. Distribution is limited to U.S. government agencies.

The overall objective of the project was to develop a generic training system that can be delivered to all relevant air ASW platforms in a deployed setting. This deployable training system (DTS) should have, as its delivery vehicle, a digital acoustic sensor simulator (DASS) that can stimulate any pertinent on-board acoustic processor. This report identifies the tasks to be included in DASS DTS training.

Job-oriented Basic Skills (JOBS) Program: Administrator's Guide. SR 81-9. February 1981. S. I. Sander and J. Murphy.

The job-oriented basic skills (JOBS) program has been operating at the Service School Command (SSC), San Diego since July 1979. In FY81, the JOBS program will be expanded to SSCs at Memphis, Meridian, and Great Lakes. This report, which is intended for use by military personnel designated to support the program, addresses the administrative aspects of the instructional program and provides background information.

EDUCATION AND TRAINING (Continued)

S-3A Sensor Operator (SENSO) Course Design: Volume I. Objectives Hierarchy; Volume II. List of Objectives. SR 81-10. February 1981. Hazeltine Corporation.

The overall objective of this task was to revise instruction for the SENSO course and for parts of the copilot and naval flight officer (NFO) courses, using instructional systems development (ISD). This report provides the objectives hierarchy and the list of objectives developed for the SENSO course.

Urban Area Combat Training: Aviation Implications. SR 81-11. February 1981. O. A. Larson, S. K. Van Beenen, and P. H. McCann. This publication is required for official use or for administrative or operational purposes only. Distribution is limited to U.S. government agencies.

The objective of this research was to identify the aircrew training requirements for Marine aviation in support of landing force operations in urban environments. For use in this effort, an urban environment was defined as a large central city with extensive multistory building development, corresponding subterranean development, and associated suburbs. A sophisticated adversary was assumed, one who could mount an anti-aircraft threat with capabilities comparable to those of the Soviet Union. Emphasis was on the roles of attack and transport helicopters and on close air support operations of fixed-wing aircraft.

Overseas Diplomacy Support Coordinator Effectiveness: An Evaluation. SR 81-16. April 1981. I. Clelland.

The purposes of this research were to assess (1) the degree to which graduates of the Navy's overseas diplomacy support coordinator (ODSC) course were providing support to their deployed commands relative to their untrained counterparts (i.e., overseas diplomacy action officers (ODAOs)), and (2) the effect of ODSC activities in reducing overseas incidents as measured by rates of nonjudicial punishments. Results indicated that ODSC graduates do apply their training in the field and receive greater command support than do ODAOs.

Computer-based Approach to the Navy's Academic Remedial Training, Project PREST: A Cost-effectiveness Evaluation. SR 81-18. May 1981. R. A. Wisher and J. W. O'Hara.

This effort was conducted to compare the instructional effectiveness of the performance-related enabling skills training (PREST) program with that of the standard classroom approach, quantify the difference in effectiveness in terms of cost savings, chart the expected future costs of each alternative as a function of time, and predict the point at which the alternatives break even. Although the immediate impact and prolonged effect of PREST and classroom instruction was equal, PREST is not now cost effective.

Device Test and Evaluation Master Plan for the Electronic Equipment Maintenance Training System (Device 11B106). SR 81-19. June 1981. S. M. Pine, R. W. Daniels, and V. M. Malec.

The device test and evaluation master plan (DTEMP) for the electronic equipment maintenance training system (EEMT) is presented in this report.

EDUCATION AND TRAINING (Continued)

Deployable Acoustic Analysis Training Using the Digital Acoustic Sensor Simulator (DASS): VII. Lesson Specifications. SR 81-23. July 1981. S. I. Windle, J. N. Ladd, and H. D. Kribs. This publication is required for official use or for administrative or operational purposes only. Distribution is limited to U.S. government agencies.

The overall objective of this research task was to develop a generic training system that can be delivered to all relevant air ASW platforms in a deployed setting. This deployable training system (DTS) should have, as its delivery vehicle, a digital acoustic sensor simulator (DASS) that can stimulate any pertinent on-board acoustic processor. This report describes the lesson specifications developed for the DTS testbed.

Upgraded Navy Computer-managed Instruction: Analysis of Requirements for and Preliminary Instructional System Specifications. SR 81-26. September 1981. N. Van Matre and K. Johnson.

This effort was conducted to determine current and near-term instructional requirements at the Navy's computer-managed instruction (CMI) system, to provide preliminary instructional system specifications, and to develop alternative CMI system upgrade approaches that would satisfy the instructional requirements. All components of the instructional system were surveyed to elicit information about system problems and user requirements. CMI system upgrade alternatives were developed by integrating survey results into information and problem summaries for each CMI organizational element.

EDUCATION AND TRAINING (Continued)

TECHNICAL NOTES

A Microprocessor-based Resistance Network Simulator for Teaching Basic Electronics. TN 81-1. J. H. Wolfe. October 1980.

This report describes a prototypical system that illustrates the capabilities and the potentialities of microprocessor-based training simulators that can be used both in classrooms and in remote sites. This development has demonstrated that relatively sophisticated programs for computer-assisted instruction can be implemented on stand-alone microprocessors.

Premastering Formats for Videodisc. TN 81-5. December 1980. R. E. Hurlock.

The optical videodisc offers a new storage and retrieval capability for visual images and audio that is superior to any other medium. This report provides information to aid in making decisions regarding the selection and use of premastering formats for instructional materials being prepared for videodisc-delivered training. The advantages and disadvantages of using film and tape formats were reviewed, and the best premastering formats for producing original materials and for converting existing audiovisual instructional materials are discussed.

Computer-based Tactical Memorization System. TN 81-8. March 1981. T. P. McCandless.

The objectives of this effort were to develop and evaluate a computer-based gaming system to facilitate the memorization of declarative information. This system has been implemented on a small stand-alone computer and ultimately will include an automated tutor to guide student-system interactions.

Life Cycle Training Costs: A Literature Review. TN 81-10. April 1981. J. R. Skeen and A. E. Jackson.

This literature review was conducted to provide background and materials for use in the construction of a life cycle training costs model for determining the cost of training associated with the life cycle of Navy weapon systems. The literature selected for review was organized into three subject areas: (1) system-oriented life cycle training, (2) instructional systems development, and (3) costing.

Development of Antisubmarine Warfare Team Training Objectives. TN 81-18. June 1981. D. A. Slough and H. W. Stern.

This effort was conducted to develop procedures for deriving objectives for team training. The procedures were used to obtain training objectives for three types of single ship antisubmarine warfare exercises: (1) search-attack unit exercises using active sonar, (2) passive sonobuoy exercises, and (3) passive target motion analysis exercises.

EDUCATION AND TRAINING (Continued)

Project STEAMER: I. Taxonomy for Generating Explanations of How to Operate Complex Physical Devices. TN 81-21. August 1981. A. Stevens and C. Steinberg.

This report describes an initial framework for the development of techniques to automatically generate explanations of the operation of physical devices like those found in propulsion plants. Examination of the textual materials directed at providing students with an understanding of how complex devices like propulsion plants operate revealed a diversity of explanations. Thus, a taxonomy for organizing explanations of physical devices is presented. Also, evidence for the taxonomy is provided, along with examples from current Navy engineering texts and operations manuals.

Project STEAMER: II. User's Manual for the STEAMER Interactive Graphics Package. TN 81-22. August 1981. L. Stead.

This report documents the general software used to present, create, and display diagrams and accept input from users of STEAMER. This documentation is intended as a reference manual for those who write STEAMER software.

Life Cycle Training Cost Model. TN 81-23. August 1981. J. R. Skeen and A. E. Jackson.

This report describes an initial life cycle training cost model for determining the cost of all training activities required to support a Navy weapon system during its entire life cycle.

Training Technology Handbook Development: Phase I. Annotated Literature Review. TN 81-24. August 1981. J. W. Kochevar, J. M. Erickson, M. T. Kramm, K. H. Briggs, S. F. Hirshfeld, R. P. Fishburne, Jr., K. R. Laughery, and M. M. Schwartz.

This report provides an annotated bibliography of technical literature relevant to identification of major training, personnel, and cost variables to be considered in projecting future training system requirements.

Project STEAMER: III. Using Qualitative Simulation to Generate Explanations of How to Operate Complex Physical Devices. TN 81-25. August 1981. K. Forbus and A. Stevens.

This report describes a method, based on incremented qualitative simulations, for automatically generating explanations and animating diagrams to explain the operation of complex devices such as those found in propulsion plants.

Project STEAMER: IV. A Primer on CONLAN--A Constraint-based Language for Describing the Operation of Complex Physical Devices. TN 81-26. August 1981. K. Forbus.

This report describes CONLAN--a computer language that allows the description of a set of objects, the composition of these objects into complex system descriptions, and the simulation of the modelled system in a qualitative manner.

EDUCATION AND TRAINING (Continued)

Project STEAMER: V. Mathematical Simulation of STEAMER Propulsion Plant. TN 81-27. August 1981. B. Roberts and K. Forbus.

This report describes the engine room portion of the STEAMER propulsion plant mathematical model and methods for interactively using it.

Training Technology Handbook for System Acquisition Planners: Preliminary Version. TN 81-28. September 1981. J. W. Kochevar, K. B. Collyard, K. W. Seibert, K. H. Briggs, D. J. Funke, K. R. Laughery, and R. P. Fishburne, Jr.

This effort was conducted to generate the data for, and develop, a *preliminary* training technology handbook. The final form of this handbook is intended to assist hardware acquisition managers, training program developers, and others in estimating the composition and cost of training required for new weapon system acquisitions.

ORGANIZATION MANAGEMENT

TECHNICAL REPORTS

Job Satisfaction Measures as Predictors of Retention for Navy Enlisted Personnel. TR 81-2. December 1980. M. H. Royle and D. W. Robertson. (AD-A093 244)

Responses made by members of four representative ratings to the job satisfaction items on the Navy Occupational Task Analysis Program (NOTAP) surveys were analyzed to determine the relationship between job satisfaction and intent to reenlist. Response data obtained from enlisted personnel in a survey of career counselor effectiveness were analyzed to determine actual reenlistment behavior, since this information could not be obtained from NOTAP data. Results showed that enlisted personnel were most satisfied with aspects of the work itself and their relations with others and least satisfied with aspects related to military life. Those in lower pay grades and those nearing the end of their first enlistment were least satisfied with aspects of both work and military life. Aspects related to the work itself predicted overall job satisfaction, while those related to military life predicted reenlistment intent. Reenlistment intent was highly related to actual reenlistment, while other variables (including job satisfaction) added little to prediction of enlistment.

Selective Retention: A Longitudinal Analysis. III. A Comparison of Recruit Training Attrites, Delayed Graduates, and Graduates. TR 81-3. December 1980. A. J. Farkas. (AD-A093 807)

The objective of this effort was to compare the attitudinal responses, collected during the first and last weeks of recruit training, of recruits who were discharged during recruit training (attrites), those who graduated from recruit training after a delay for remedial or medical treatment (delayed graduates), and those who graduated from recruit training without delay (graduates). At the beginning of recruit training, the attitudes of delayed graduates and graduates were similar and were significantly more positive than were those expressed by the attrites. At the end of training, delayed graduates and graduates exhibited a large number of attitudinal differences. The delayed graduates reported more negative experiences during recruit training, less intention to complete their enlistment, less satisfaction with the Navy, and less commitment to the Navy than did the graduates. The delayed graduates also experienced a higher rate of post recruit training attrition during the first 20-21 months of the first enlistment than did the graduates.

Surface Warfare Junior Officer Retention: Spouses' Influence on Career Decisions. TR 81-17. August 1981. D. A. Mohr, R. L. Holzbach, and R. F. Morrison. (AD-A103 425)

Information obtained from a questionnaire to which 312 male surface warfare junior officers (JOs) responded was used to determine how JOs felt their wives influenced their intent to pursue a Navy career, and how their wives felt about separations, relocations, pay, and benefits of Navy life. Officers, in general, felt their wives were supportive of their Navy careers. Separation was considered the worst aspect of Navy life and had the most pronounced influence against a Navy career. Wives who were most supportive of a Navy career were most socially and emotionally involved in the career. Wives who worked outside the home were less supportive of a Navy career than were those who worked within the home. Wives who

ORGANIZATION MANAGEMENT (Continued)

were teachers or Navy officers found relocations more difficult to accommodate and were more reluctant for their husbands to remain in the Navy than were wives in other types of jobs. Few Navy wives attended detailer field trip meetings, but those who did were more supportive of a Navy career than those who did not. The assistance of superior officers in helping wives adjust to new duty stations was rated most helpful, and Navy Family Services least helpful, indicating that COs and XOs should recognize their influence on officer retention, and that officers and their wives should be educated on the value and use of Navy Family Services to alleviate stresses of relocation and separation.

A Practical Methodology for Identifying Impediments to Productivity. TR 81-18. August 1981. M. A. White, L. Y. Atwater, and D. A. Mohr. (AD-A104 577)

The methodology followed by NAVPERSRANDCEN in conducting an investigation of impediments to productivity at five Navy industrial facilities in 1980 is described in detail. The methodology included unstructured individual interviews, structured group interviews (using the nominal group technique), and open-ended questionnaires. General instructions for conducting interviews, preparing questionnaires, obtaining samples, and evaluating responses are also provided.

ORGANIZATION MANAGEMENT (Continued)

SPECIAL REPORTS

Executive Report: A Cross-cultural Investigation of the Navy Public Works Centers. SR 81-1. October 1980. J. A. Riedel and L. E. Young.

A survey was conducted at six of the Navy's Public Works Centers (PWCs) in the summer of 1977 to determine how Navy civilian employees' perceptions of various aspects of the work environment differ across cultural and ethnic groups and across hierarchical levels. A better understanding of these differences should enable Navy planners and policymakers to improve civilian personnel management. Previous reports on the study described the relationships between (1) cultural and work-related values and attitudes and organizational functioning, (2) employee perceptions of role stress and individual, organizational, and environmental variables, and (3) employee perceptions of organizational effectiveness and managerial, organizational, and satisfaction variables. This report provides an executive summary of the previous findings.

An Examination of Productivity Impediments in the Navy Industrial Community. SR 81-2. October 1980. L. A. Broedling, K. S. Crawford, G. D. Kissler, D. A. Mohr, A. R. Newman, M. A. White, H. Williams, L. E. Young, and T. J. Koslowski.

The purposes of this effort, which was conducted jointly with the Western Regional Office of Personnel Management, were to identify impediments to productivity within the Navy's industrial community, determine the source of these impediments, and, where possible, provide recommendations for removing them. Five Navy Material Command field activities (shipyard, weapons station, supply center, public works center, and air rework facility) were selected as representative of the major types of organizations in the Navy's industrial community. Impediments were identified through one-on-one interviews, group interviews, and questionnaires. Impediments to productivity common to more than one activity were identified in such diverse areas as supply support, automated data processing equipment, erratic workloads, inadequate capital investment, micromanagement, military rotation, pay/position management, staffing, technical/managerial training, and employment restrictions. Impediments unique to a particular type of organization (e.g., propeller waivers for shipyards) were also identified. Specific recommendations are provided, where possible, for removing or further assessing the impact of identified impediments.

Male Black College Students: Their Views of the Navy and Characteristics of a Navy Career. SR 81-4. November 1980. J-M. B. Mayas and M. O. Smith-Waison.

To determine how Black college males perceive the Navy and Navy careers, a survey questionnaire was administered to 1233 undergraduate males (904 Blacks and 329 Whites) at 12 colleges and/or universities. Half of the institutions were predominantly Black; and half, predominantly White. Half had NROTC units and half did not. Results showed that the Air Force was rated highest by Black respondents, followed by the Navy, Coast Guard, Army, and Marine Corps. Both Black and White respondents reported that (1) television and radio advertisements, news reports, and military recruiters contributed most to the way they think and feel about the Navy and (2) military literature and billboards, nonveteran friends, and school counselors, in that order, conveyed the most positive sentiments about the Navy. Significantly

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more Blacks than Whites believed that "affirmative action programs broaden the opportunities for success for both majority and minority officers" in the Navy. Also, respondents' perceptions of the relative success of affirmative action activities were significantly related to both overall attitude toward the Navy and aspects of Navy life. Blacks were significantly less positive toward the Navy and Navy career aspects than were Whites and (2) significant differences existed between students attending institutions with and without NROTC.

Human Resource Management (HRM) Cycle: Effect on Readiness Status of Navy Ships. SR 81-12. March 1981. E. D. Thomas and E. W. Curtis.

This effort was conducted to determine how participation in the human resources management (HMS) cycle affects the readiness of Navy ships. Readiness ratings from the Naval Force Status (NAVFORSTAT) report--in which each ship's ability to perform its mission is rated in five areas by its commanding officer--were analyzed for 103 ships that had participated in the HRM Cycle and 103 that had not. Results show that participation in the HRM cycle has a measurable, albeit modest, effect on a command's overall and equipment readiness rating.

Investigation of Operating Problems in Division 640, NARF, Alameda. SR 81-15. April 1981. H. L. Williams, G. Rowe, and N. Brownberger.

A special methodology was used to investigate the operations of Division 640, NARF, Alameda. Problems and their causes were identified by interviewing engineers and technicians and by investigating 24 major projects to which division personnel had been assigned. Recommended changes were developed by a working group made up of Division 640 supervisory personnel and the NAVPERSRANDCEN analyst assigned to the program.

Quality Circles in the Navy: Productivity Improvement or Just Another Program? SR 81-21. July 1981. L. Y. Atwater. (AD-A101 873)

One attempt to overcome declines in productivity and product quality by means of employee involvement is the quality control circle (QC) program. Under this program, groups of employees from the same work area meet regularly on a voluntary basis to identify and analyze work-related problems and recommend solutions to management. Interest in implementation of QCs is spreading rapidly in both the public and private sectors. This report (1) provides information concerning QCs, (2) presents the results of a questionnaire that assessed the interest and involvement of Navy organizations in productivity improvement programs in general and QCs in particular, and (3) presents a plan, based on the results of the questionnaire, for implementing QCs in Navy organizations.

The Effects of Unmet Expectations, Satisfaction, and Commitment on the Reenlistment Intentions of First-term Enlisted Personnel. SR 81-25. August 1981. A. J. Farkas.

This effort was conducted to determine how unmet expectations, changes in satisfaction, and changes in commitment relate to changes in the intention to reenlist. Subjects consisted of 575 male, first-term enlisted personnel who responded to questionnaires administered (1) during the 8th week of recruit training (Time 1), (2) 8 to 10 months after the beginning of recruit training (Time 2), and (3) 20 to 21

ORGANIZATION MANAGEMENT (Continued)

months after the beginning of recruit training (Time 3). Results showed that (1) respondents' expressed intention to complete their enlistment decreased slightly from Time 1 to Time 2, but held steady after that point, (2) respondents' expressed intention to reenlist or to have a Navy career decreased steadily from Time 1 to Time 3, (3) the general attitudes of these recruits toward the Navy (e.g., general satisfaction) became progressively more negative, (4) organizational commitment to the Navy declined steadily from a high point at the end of boot camp, (5) the recruits had more positive expectations concerning supervision, peer relations, and job characteristics in the Navy at Time 1 than at Time 3, and (6) there was no causal relationship between general satisfaction and organizational commitment.

ORGANIZATION MANAGEMENT (Continued)

TECHNICAL NOTES

First-term Navy Attrition Research: A Study of Ongoing and Future Research Directions. TN 81-2. October 1980. G. D. Kissler.

This report includes a review of past attrition research, an assessment of current attrition research at NAVPERSRANDCEN, and a suggested framework for use in future counterattrition efforts.

Workflow in Production Shops at NARF, Alameda. TN 81-12. April 1981. H. L. Williams and D. A. Mohr.

This report describes (1) the work processes in selected shops of the NARF Power Plant Division, (2) existing conditions that could adversely affect the success of the productivity enhancement program being implemented, and (3) features of the work processes that may be reducing shop productivity.

Women in the Military: Gender Integration at Sea. TN 81-13. May 1981. P. J. Thomas.

In October 1978, the Federal Code was modified to permit the assignment of women to U.S. Navy ships, overturning several hundred years of tradition. This study was conducted to measure and observe factors hypothesized to be associated with the integration process. Results showed that the attitudes measured in the preintegration survey were highly related to both the individual and organizational variables of interest. Although nonrated men held the most traditional beliefs about women's roles in the workplace, they liked working with women more than did any other group. On the postintegration survey, petty officers were the least positive of any group about the success of integration. Department effects were also evident. Women felt more performance pressure than men and experienced more problems aboard ship.

Performance Contingent Monetary Rewards for Individual Productivity: Principles and Applications. TN 81-14. May 1981. E. C. Shumate, S. L. Dockstader, and D. M. Nebeker.

The purpose of this effort was to provide detailed information concerning a performance contingent reward system (PCRS), an incentive management program aimed at increasing individual productivity. The report describes the critical elements required for such a program and shows how these elements were "engineered" into management practices in several different organizations. Although the PCRS was developed primarily to help find answers to research questions concerning relationships between motivation and productivity, it is hoped that a description of methods used by applied scientists may be of value to those supervisors who desire to improve the productivity of their organization.

PERSONNEL ADMINISTRATION

TECHNICAL REPORTS

New Criteria for the Selection and Evaluation of Sonar Technicians. TR 81-13. July 1981. R. R. Mackie, R. R. Ridihalgh, and T. E. Shultz. (AD-B059 973L)

To improve selection and evaluation procedures for operator personnel of current and future sonar systems, standardized and experimental selection tests were administered to a sample of students undergoing sonar operator training at the Anti-submarine Warfare Training Center, Pacific. The predictor tests were later validated against typical academic (written test) criteria as well as against measures of operational performance, including target detection, report timeliness, target classification, and target tracking and localization. It was shown that presently used selection tests are totally inadequate as predictors of operational performance, although they do predict academic performance. Use of a number of the experimental predictor tests would substantially improve the selection process as measured by either academic or operational criteria.

Performance Evaluation Narratives of Navy Women and Men: An Examination for Bias in Promotion. TR 81-14. July 1981. V. F. Nieva, S. M. Mallamad, E. J. Eisner, S. H. Mills, and P. J. Thomas. (AD-A102 701)

The narrative sections of performance ratings for 52 men and 52 women eligible for promotion to chief petty officer were analyzed to determine whether statements included in the narrative section or the manner in which the statements were interpreted by the selection board were subject to sex bias. Results showed that there was no significant difference in the number of positive statements made on the performance of men and women. However, significant interactions between sex and selection status (selected for promotion or not selected) were found in two evaluation categories: (1) motivation and personality traits and (2) dimensions of concern to the Navy (awards, oral communication skills, appearance). Women who were not selected had more positive statements related to motivation and personality than did either men or women who were selected, indicating that positive performance in this dimension did not enhance promotion prospects. Men who were not selected had more positive statements on dimensions of concern to the Navy than did men who were selected.

Relationship Between the Armed Services Vocational Aptitude Battery (ASVAB) and Surface Sonar Technician Performance. TR 81-19. August 1981. R. R. Mackie, R. R. Ridihalgh, M. L. Seltzer, and T. E. Shultz. (AD-B059 929)

In the interest of determining the effectiveness of the Armed Services Vocational Aptitude Battery for identifying recruits who have a high probability of becoming effective surface sonar operators, the validity of the current surface sonar technician ASVAB standard for predicting the performance of sonar operators was compared with that of two experimentally identified alternative ASVAB composites. The criterion was a comprehensive performance test comprising 40 aspects of sonar operator performance. An improved ASVAB composite was identified and certain deficiencies in the currently used selection standard were pointed out. The possible difficulty of using a single ASVAB composite for selecting both the most efficient operators and the most efficient maintainers of sonar equipment was discussed.

PERSONNEL ADMINISTRATION (Continued)

Development and Validation of a Recruiter Selection Battery. TR 81-20. September 1981. W. C. Borman, R. L. Rosse, J. L. Toquam, and N. M. Abrahams. (AD-A104 681)

At a time when the military forces are largely dependent on the quantity and quality of volunteers, the criticality of the role played by recruiters in meeting manpower supply requirements cannot be overemphasized. This report describes the development and validation of a battery of primarily paper-and-pencil instruments to identify those individuals most likely to become successful recruiters. Instruments contained in this battery include self-description inventories, biographical data, and vocational interest measures. This recruiter selection battery was administered to a geographically representative sample of Navy recruiters. Two primary measures of success were used: Ratings gathered from supervisors and peers and production data (i.e., enlisted accessions) compiled over a 6-month period. The magnitude of the relationship observed between the scores on the experimental battery and the various performance criteria, particularly that of production, was sufficiently high to recommend that the battery be operationally implemented.

Evaluation of Aptitude and Achievement Composites for the Initial Classification of Marine Corps Officers. TR 81-21. September 1981. R. D. Hetter and N. M. Abrahams. (AD-A107 772)

As part of an ongoing project to develop a classification system for Marine Corps officers, aptitude, background, and performance data routinely collected by the Marine Corps were analyzed to determine their usefulness as predictors of performance in 12 follow-on specialty schools. Four schools had samples large enough for the development and cross-validation of multiple regression composites. Evaluation of manual and computer-assisted optimal assignment methods based on the composites indicated that the composites are effective in differentially predicting follow-on school performance.

PERSONNEL ADMINISTRATION (Continued)

SPECIAL REPORTS

Counterattrition in Basic Underwater Demolition/SEAL Program: Selection and Training. SR 81-13. March 1981. L. M. Doherty, T. Trent, and G. E. Bretton.

Attrition patterns at the Basic Underwater Demolition/SEAL (BUD/S) School and relationships between attrition and student selection variables, "hellweek," and instructor/leader selection and training were identified, and recommendations were made to reduce attrition rates. Analysis of attrition and performance data for classes held before and after the implementation of some of these recommendations showed substantial reduction in attrition with no decrease in performance.

Relationship Between the Armed Forces Vocational Aptitude Battery and Aviation Antisubmarine Warfare Operator Performance: A Pilot Study. SR 81-14. March 1981. R. M. Bearden.

The relationship between Armed Services Vocational Aptitude Battery (ASVAB) standards and actual job performance measures for aviation antisubmarine warfare operators (AWs) was examined. For both AW performance tests--acoustical performance test (APT) and cognitive acoustical test (CAT)--alternative composites were identified that were significantly more valid than the current AW selector composites.

Ranking the Density and Criticality of Enlisted Navy Ratings. SR 81-27. September 1981. W. A. Nugent.

The Navy and the other services have been requested to develop standards for enlistment and assignment to military specialty that are predictive of successful performance on the job. Further, it has been proposed that each service establish and validate these standards for 75 percent of the enlisted accessions entering vocational training. This effort was conducted to (1) identify a set of candidate ratings to be considered for the proposed validation effort, (2) develop methods to rank-order ratings based on the number of persons in the rating (i.e., rating density), and (3) rank-order ratings based on mission criticality of the rating within air, surface, and subsurface type commands. The ranking based on rating density yields the most economical approach to accomplishing the objective of the proposed validation effort.

PERSONNEL ADMINISTRATION (Continued)

TECHNICAL NOTE

The Manpower Quality Decline: An Ecological Perspective. TN 81-4. B. Rimland and G. E. Larson. November 1980.

This paper was begun as an attempt to resolve the conflicting and controversial reports issued from various sources on a perceived drop in the quality of military manpower in the middle and late 1970s. However, because a decline in the quality of military manpower might simply reflect a decline in civilian youth, the scope was enlarged to encompass various indices of the quality of civilian youth.

In studying the purported civilian decline, the authors examined the various hypotheses that have been advanced to account for the drop in Scholastic Aptitude Test (SAT) scores and in other criteria of civilian quality. The various approaches that might be used to correct or cope with the military quality decline are discussed, and recommendations made for research on the approaches regarded as most promising.

HUMAN PERFORMANCE

TECHNICAL REPORTS

Austere Manning in the Guided Missile Frigate (FFG 7 Class): Lessons Learned. TR 81-10. April 1981. M. A. Schwartz. (AD-A099 215)

A manpower constraint imposed on designers of the FFG 7 influenced equipment design, maintenance and support strategies, training requirements, and ship organization. Results of a brief examination of the impact of this constraint on FFG 7 design, maintenance strategy, and training needs indicated that the original manpower accommodation constraint was premature and led the ship acquisition manager to make manpower, personnel, and training assumptions that could not be realized. An important deficiency in early system planning was the failure to consider projected manpower availability for critical skill areas. The attempt to design systems for austere manning can result in low tolerance of the system for degradation to personnel levels, especially highly skilled personnel in short supply.

Air Defense: A Computer Game for Research in Human Performance. TR 81-15. July 1981. R. T. Kelly, F. L. Greitzer, and R. L. Hershman. (AD-A102 725)

A laboratory simulation system was developed for research on human performance in anti-air warfare threat analysis. Major elements of the threat analysis problem were embedded in an interactive air defense game controlled by a desktop microcomputer. The problem for the player is to decide when to launch "missiles" at hostile targets that approach at different speeds; the task load is manipulated by varying the number of targets and their arrival rate. The specification of a mathematically ideal information processor provides a standard of optimal performance. Feedback is given to the player after each engagement, and performance data are automatically stored for subsequent analysis.

Navy enlisted men served in a demonstration experiment that confirmed the feasibility of the system. Approximately 3 hours of practice produced proficient levels of performance. The course of skill acquisition was largely insensitive to training manipulations. Effects of task load were evidenced by a decline in performance as the number of targets and the pace of operations were increased. Performance was also impaired by the introduction of a concurrent auditory monitoring task. Test subjects found the game challenging and sustained their attention to the task for extended periods.

HUMAN PERFORMANCE (Continued)

SPECIAL REPORTS

Engineer's Guide to the Use of Human Resources in Electronic System Design: An Evaluation. SR 81-3. November 1980. R. A. Dick and E. A. Koehler. (AD-A093 539)

This effort was conducted to evaluate the Engineer's Guide to the Use of Human Resources in Electronic System Design by determining the validity of its methodology, the adequacy of its data, and the degree to which it can be implemented (see NPRDC TN 79-8). The results of a survey administered to representative members of the Navy systems acquisition and development communities clearly show the guide's overall potential utility in making human resources a specific design consideration and in providing necessary technical data. Recommendations desirable for successful implementation are provided.

A Proposed Organizational Model for Implementing a Shipboard Facilities Maintenance Improvement Program. SR 81-17. April 1981. M. A. Schwartz.

A proposed organizational model for implementing a shipboard facilities maintenance (SFM) improvement program was developed. Functions and responsibilities of participants were defined.

HUMAN PERFORMANCE (Continued)

TECHNICAL NOTES

System Design Characteristics and User Skills: A Literature Review. TN 81-9. March 1981. D. Sullivan.

Recent studies conducted by the human resources research community were reviewed to determine how hardware design engineers perceive the relationships between system design characteristics and skills of system operator and maintenance personnel. Special attention was directed toward research conducted on (1) the design process and skill information needs of designers, (2) job performance, (3) the analysis and measurement of skills, and (4) the presentation of human resources information.

Designing for Human Skills in Navy Electronic Systems. TN 81-15. June 1981. Hughes Aircraft Company.

A preliminary design guide that could assist hardware developers in understanding the basis for human performance of system functions and tasks in traditional surface Navy electronic systems was developed. Further development of this guide has been abandoned in favor of a related effort.

Research Leading to the Development of a Guidebook on the Use of Human Resources in Electronic Systems Design. TN 81-17. June 1981. R. R. Mackie, R. A. Dick, C. D. Wylie, and R. R. Ridihalgh.

This study was directed toward the human resource requirements related to design concepts that might be applied to five classes of surface ship electronics systems: radar, sonar, communications, fire control, and data processing. Reviews of the literature and interviews with engineers led to the identification and definition of 21 design concepts. The impacts of these concepts on 14 criteria, including both human resource and more traditional system design criteria, were determined by means of a unique ranking/rating technique using 32 Navy engineers as expert judges.

Comprehensive taxonomies of operation and maintenance tasks that must be performed in connection with each type of electronic system were also developed. Estimates of how well each task could be performed by Navy technicians having different levels of experience were obtained using a total of 120 supervisory technicians as the judges.

A Performance Proficiency Assessment System (PPAS) for Surface Sonar Technicians: Specifications for Simulated Troubleshooting Tests. TN 81-19. July 1981. A. P. Chensoff, D. L. Scott, and R. P. Joyce.

A specification for use in developing diagnostic tests of electronic troubleshooting as performed in four antisubmarine weapons (ASW) systems was produced. The tests are to form part of a performance proficiency assessment system (PPAS) that provides manpower managers with data about personnel capabilities for use in making decisions about selection, training, and assignment.

The specification prescribed the development of seven subtests, which assess individual critical troubleshooting skills as well as the ability to "put it all together." The test development procedure, as specified, provides a standardized, optimized

HUMAN PERFORMANCE (Continued)

process for developing efficient, job-relevant, diagnostic tests that assess the capability of troubleshooting to isolate casualties within the four ASW systems.

Design Engineers' Concepts of Skills for System Operation and Maintenance. TN 81-20. July 1981. R. J. Hornick, J. E. Robinson, J. G. Rogers, and D. Sullivan.

This effort was part of a program aimed at developing tools for hardware developers to use in assessing the personnel implications and costs of alternative design options. It was conducted to determine (1) the kinds of skill concepts engineers apply to their designs and (2) whether the sophistication of these skill concepts can be increased by presenting the engineer with a structured framework based on behavioral research.

MANPOWER MANAGEMENT

TECHNICAL REPORTS

Review and Analysis of the Legislative History/Intent, Cost, and Value of Special Pay While on Duty at Certain Places. TR 81-1. November 1980. J. Dorsey, R. King, and M. Rowe. (AD-A092 726)

Certain Places Pay (CPP) is provided to enlisted personnel serving at specified locations outside the contiguous United States as a morale factor and in recognition of the greater-than-normal rigors of service at such locations. Because CPP rates have not changed since 1949, the pay has declined from about 10 percent of base pay to less than 2 percent. As a basis for developing a set of alternative CPP rates and payment plans, this effort examines the legislative history/intent/CPP, the criteria for awarding the pay, and the cost and value of CPP.

Life Cycle Navy Officer Billet Costs--FY81. TR 81-12. June 1981. E. A. Koehler. (AD-A100 659)

The officer billet cost model has been developed to compute the cost of manning Navy billets with officers having requisite designators and grades, in terms of investment and operating cost to the U.S. government, for each year in the life cycle of a given billet. The resulting cost data are displayed in 22 designator groups by pay grade and reflect the total cost of manning an established or proposed billet.

The STRAP Enlisted Predictor (STEP). TR 81-16. July 1981. J. I. Borack and K. W. Gay. (AD-A102 910)

A new computerized management system, the structured accession planning (STRAP) system, is being developed to provide Navy planners with techniques to perform integrated manpower management. This system will enable planners to evaluate the relationships between alternative manpower requirements, personnel policies, and the available pool of qualified military manpower. STRAP is comprised of computerized modules that focus on the major determinants of manpower and personnel policy. These modules include manpower requirements determination, personnel policy evaluation, accession requirements determination, manpower supply forecasting, and personnel flow/loss estimation. This report describes the STRAP enlisted predictor (STEP) module, which provides STRAP with estimates of personnel flows and losses.

MANPOWER MANAGEMENT (Continued)

SPECIAL REPORTS

Life Cycle Navy Enlisted Billet Costs--FY 1981. SR 81-22. July 1981. E. A. Koehler and R. F. Turney. (AD-A103 043)

The enlisted billet cost model has been developed to compute the cost of manning Navy billets with personnel having requisite ratings and pay grades, in terms of investment and operating cost to the U.S. government, for each year in the life cycle of a given billet. The resulting cost data are displayed for each active Navy rating by pay grade and reflect the total cost of manning an established or proposed operational billet.

Navy Civilian (Civil Service) Billet Costs--FY 1981. SR 81-24. July 1981. E. A. Koehler. (AD-A104 564)

The Navy civilian (Civil Service) billet cost model has been developed to compute the costs of manning Navy billets with employees of given occupational groups and pay grades. Data were collected for both general schedule (GS) and wage board (WB) billets. Investment and operation costs that the government must incur in creating and supporting each billet were established and are presented in 1-, 5-, 10-, 15-, and 20-year increments.

MANPOWER MANAGEMENT (Continued)

TECHNICAL NOTES

The Enlisted Survival Tracking File (STF). TN 81-11. April 1981. K. W. Gay, and J. I. Borack.

This report describes an enlisted longitudinal data base jointly developed by the Navy Military Personnel Command (NMPC 164) and the Navy Personnel Research and Development Center. For each individual who served in the enlisted force since September 1977, the data base contains a sequence of records derived from the Navy's enlisted master file at quarterly intervals. This structure permits analysis of the longitudinal behavior of individuals or groups of individuals (e.g., cohorts).

An Econometric Model of Navy Enlistment Behavior. TN 81-16. June 1981. B. S. Siegel and J. I. Borack. (AD-A101 1365)

This report describes an econometric model of the enlistment process, provides parameter estimates of the model, and forecasts "supply" (or, more accurately, enlistment contracts) under alternative scenarios.

R&D METHODS AND TECHNIQUES

TECHNICAL NOTES

Test Equating Using Stratified Sampling: A Simulator Study. TN 81-3. October 1980. J. H. Wolfe.

The objective of this research was to determine whether or not the stratification method yields unbiased estimates of population scores when applied to selected samples. All simulations showed that stratified weighting underestimates the population percentiles below the median and, in the symmetrically truncated group, overestimates population percentiles above the median.

Some Statistical Procedures for Domain-referenced Testing: A Handbook for Practitioners. TN 81-6. February 1981. R. L. Brennan.

This report provides a handbook of statistical techniques for producing and evaluating domain-referenced tests (DRTs) for use by Navy practitioners who develop and assess DRTs and/or criterion-referenced tests. This handbook considers item analysis procedures, techniques for establishing cutting scores, errors of measurement and classification, test length, and advancement scores, as well as group-based coefficients of agreement.

Improving the Validity of a Criterion-referenced, Diagnostic Test Using a Discriminant Function Procedure. TN 81-7. March 1981. R. Bearden.

The purpose of this effort was to determine whether an application of discriminant function analysis could significantly improve the overall predictive validity of the scores on a diagnostic criterion-referenced test. In this statistical procedure, the examinee's score is based on the sum of the individual item discriminant weights as opposed to one for a correct response and zero for an incorrect one.

BIBLIOGRAPHIES, REVIEWS, AND SUMMARIES

SPECIAL REPORTS

Bibliography: Unclassified Technical Reports, Special Reports, and Technical Notes: October 1979 Through September 1980. SR 81-8. January 1981.

This report lists all unclassified technical reports, special reports, and technical notes that have been published by this Center from October 1979 through September 1980. Publications in each category are listed in chronological order under six areas: manpower management, education and training, organizational management, personnel selection and assignment, human performance, and bibliographies/annual reports.

Independent Research and Independent Exploratory Development at the Navy Personnel Research and Development Center--FY80. SR 81-20. June 1981. B. Rimland.

The independent research (IR) program at the Navy Personnel Research and Development Center has been active since the Center was formed in 1973. The independent exploratory development (IED) program was initiated in FY76. This annual IR/IED report provides synopses of current IR/IED projects, the IR/IED funding profile, and a list of publications and presentations on IR/IED projects.

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